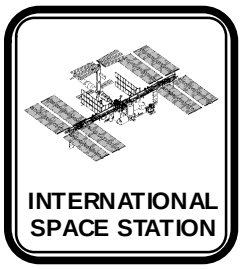

ISS Payload Mission Evaluation Request

Date of Request: 8 Aug 97

Revision of Previous Submittal

Yes ☐

RETURN TO:

Discipline Manager: Jack Gavalas Telephone.: (281) 244-7716
E-Mail: jgavalas@ems.jsc.nasa.gov
ISS Payloads Office
Mail Code OZ4
Houston, TX 77058
Fax: (281) 244-8292

FROM:

Sponsoring Organization/Agency: Naval Research Laboratory
Address: Code 7621, 4555 Overlook Ave., SW
Program Manager: Kent S. Wood
Telephone: 202-767-2506

Form Completed by:
Name Kent S. Wood & Paul S. Ray Telephone 202-767-2506 (KSW) 202-404-1619 (PSR)
Organization NRL Code 7621 Fax 202-767-0497
Address 4555 Overlook Ave., SW E-mail wood@ssd0.nrl.navy.mil (KSW), paulr@xip.nrl.navy.mil (PSR)
City, State Zip Code Washington, DC 20375

**** Note: If Payload is Multi-rack Facility, please complete a Payload Mission Evaluation Request for each rack**
Payload Title Silicon X-ray Imager
Acronym SIXI Discipline DoD
Payload Type Unpressurized **Funding Approved** Yes ☐
(Pressurized/Unpressurized)
Special Agreement Yes ☐
If Yes, check type Commercial ☐ International ☐ Other ☐ Explain:

Technical Point of Contact
Name Kent S. Wood Telephone 202-767-2506
Organization NRL Code 7621 Fax 202-767-0497
Address: 4555 Overlook Ave., SW E-mail wood@ssd0.nrl.navy.mil
City, State Zip Code: Washington, DC 20375

Payload Purpose/Objectives (A brief statement of the primary purpose and objectives of the payload.): The primary objective of the SIXI instrument is to continue and extend upon the work begun with the USA Experiment on ARGOS in three areas: (1) astrophysical studies of celestial and solar X-ray phenomena; (2) flight demonstrations of 32-bit high-throughput computers and competing commercial off-the-shelf technologies; and (3) use of X-ray sensors for applied experiments in navigation and near-Earth phenomenology. In addition, a prototype of an advanced silicon-strip based gamma-ray pair conversion telescope will be tested.

Description of Hardware (Brief description of primary and associated hardware and critical physical interfaces.): SIXI consists primarily of an X-ray imaging system and a prototype gamma-ray telescope. The imager is made up of a coded-aperture mask, a silicon strip detector stack, and associated electronics. The gamma-ray telescope prototype consists of a tower of alternating lead converter foil and silicon strip tracker elements backed with a thick CsI scintillating calorimeter.

Payload Operation (Brief description of how the payload will be operated. Identify any other payloads that need to be co-manifested, or available on orbit, to support this payload's operation.): The SIXI central electronics are capable of long periods of autonomous operation. Command sequences will be generated by the SIXI team at NRL with each day's schedule and uploaded to the instrument. All necessary control of the instrument, including one axis pointing (if included) will be handled by the on-board CPU.

Payload Readiness
Requested Launch Date UF-5, 06/02
Existing Hardware From Previous Flights? Describe Central electronics derived from USA Experiment (NRL-801) on ARGOS (P91-1)
Preliminary Design Review Date 1999
Critical Design Review Date 1999
Hardware Turnover Date 2001
Payload of Opportunity (i.e., On Standby) Yes ☐ No ☒

Hardware Transportation Requirements
UP (Ascent)

Requested Flight (# or date)	Hardware Item (Name)	Mass (kg)	Volume (m3)	Carrier, if known (e.g. Rack, Middeck Locker)	Location, if known (e.g. Cargo Bay, MPLM)	Additional Information
UF-5, 06/02	SIXI	150	0.78	Unknown	Unknown	
				Unknown	Unknown	
				Unknown	Unknown	
				Unknown	Unknown	
				Unknown	Unknown	

DOWN (Descent)

Requested Flight (# or date)	Hardware Item (Name)	Mass (kg)	Volume (m3)	Carrier, if known (e.g. Rack, Middeck Locker)	Location, if known (e.g. Cargo Bay, MPLM)	Additional Information
Post-06/05	SIXI	150	0.78	Unknown	Unknown	
				Unknown	Unknown	
				Unknown	Unknown	
				Unknown	Unknown	
				Unknown	Unknown	

Power Requirements
Ascent Power (kw) 0
Descent Power (kw) 0
Keep Alive Power (on-orbit, minimum power during off-nominal conditions necessary to prevent loss of experiment, kw) 160 W
Auxiliary Power Required Between Runs (on-orbit, kw) 160 W

Thermal Requirements
Air Cooling Ascent (kw) N/A Descent (kw) N/A
Describe
On-orbit Cooling (payload operational temperature in °C): None; passive cooling)

Late Installation/Early Retrieval Requirements
Late Installation/Servicing Yes ☐
If yes, Launch minus "x" hours (hours) N/A
Describe
Installation Duration (mins)
Early Payload Removal Yes ☐
If Yes, Landing plus "x" hours (hours)
Describe
Removal Duration (mins)

Standard On-Orbit Run (Operational Cycle) Requirements (Based on "average" or "standard" operational cycle. These requirements in conjunction with on-orbit "per run" resource requirements are used to estimate total payload resource needs.)
Continuous Operations Yes ☒ Explain continual observations of celestial targets
"Average" or "Standard" Run Duration (hours) 0.3 hr
Run Frequency (runs/year) 10,000
Total Runs Required Before Payload Returns (#) 30,000
Minimum Time Between Runs (hours) 0.0 hr
Special Run Scheduling Requirements Explain N/A

Per Run On-Orbit Operations Resources Requirements

Per Run Resources	Units	Peak Requirement		Off-Peak "Average" or "Standard" Requirement	
		Quantity (see units)	Duration (hours)	Quantity (see units)	Duration (hours)
Power	kilowatts			160	cont
Heat Rejection	kilowatts			N/A	
Data Uplink	Mb/s			0.01	1
Data Downlink	Mb/s			0.128	cont
Analog Video Uplink	Mb/s			0	
Analog Video Downlink	Mb/s			0	
Crew, Primary	# persons			0	
Crew, Secondary (e.g. crew subject)	# persons			0	

Per Run Resupply Usage & Product Generation

Storage Type	Resupply		Product	
	Mass (kg)	Volume (m^3)	Mass (kg)	Volume (m^3)
Passive	**N/A**			
Waste	**N/A**	**N/A**		
+4° C Refrigerator	**N/A**			
-20° C Freezer	**N/A**			
-80° C Freezer	**N/A**			
-183° C Cryofreezer	**N/A**			
Incubator °C	**N/A**			

Per Run Consumable Requirements

Per-Run ISS provided Consumables	Volume (m^3/run)
Gaseous Nitrogen (GN_2)	N/A
Argon (Ar)	N/A
Helium (He)	N/A
Carbon Dioxide (CO_2)	N/A
Potable Water	N/A

Microgravity Requirements
Active Rack Isolation System (ARIS) Required Yes ☐
Explain N/A
Steady-State Microgravity Level Required

Laptop Computer
Do you need a Laptop Computer to interface with your payload? Yes ☐
Explain Not essential

External Requirements
Location On-Orbit: EXPRESS Pallet ☒ Truss Site ☐ Exposed Facility ☐
Other ☐ Explain
External Deployed Dimensions (LxWxH) (m) L 1.20 W 1.05 H 0.62
External Packaged Dimensions (LxWxH) (m) L 1.20 W 1.05 H 0.62
Viewing Direction Zenith-aft-mounted; viewing aft, from Earth limb to zenith
EVA Required (Explain) NO
Special Servicing RequiredNO

Payload Support Equipment *Check required equipment:*

+4 C^0 Refrigerator	☐	Camera, Still	☐	Microgravity Sciences Glovebox	☐	Microscope, Compound	☐
-20 C^0 Freezer	☐	Camera, Standard Video	☐	Life Sciences Glovebox	☐	Microscope, Dissecting	☐
-80 C^0 Freezer	☐	Camera, High Resolution Video	☐	Portable Glovebox	☐	Mass Measuring Device, Small	☐
Freezer, Cryogenic Storage	☐	Camera Locker	☐	Incubator	☐	Mass Measuring Device, Micro	☐
Freezer, Quick/Snap Cryogenic	☐	General Purpose Hand Tools	☐	Specimen Service System	☐	Digital Multimeter	☐
Refrigerated Centrifuge	☐	Restraints and Mobility Aids	☐	Cleaning Equipment	☐	Digital Recording Oscilloscope	☐
Battery Charger	☐	Passive Dosimeter Reader/Annealer	☐	Housekeeping Equipment	☐	pH Meter/Ion Specific Analyzer	☐
DC Power Supply	☒					Function/Sweep Generator	☐

Training
Average Duration of Training Sessions (hours) 6
Frequency of Training one-time

Type of Training	Number of Sessions	Fidelity of Training Hardware		
		Flight Hardware	Mockup	Engineering Hardware
Advanced at Payload Site	1	☐	☐	☒
Advanced at JSC	1	☐	☐	☒
Increment at Payload Site	0	☐	☐	☐
Increment at JSC	0	☐	☐	☐
Refresher	1	☐	☐	☒

Additional Requirements
Vacuum Yes ☐ Waste Gas Vent Yes ☐ Observation Window Yes ☐
Other N/A

Special Services (List any anticipated services required): N/A

Additional Information: N/A